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Main controlling factors of remaining oil and favorable area prediction of Xinli oilfield VI block

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Abstract: The main control factors of remaining oil of low permeability reservoir is system analyzed through the combination of dynamic and static method, in view of the low permeability characteristics of the Xinli oilfield. By using the method of geological modeling, static and dynamic factors affecting residual oil distribution is analyzed, it is concluded that the main factors affecting static are the tectonic and sedimentary facies, and the main dynamic factors are the types of injection-production well pattern and horizon of fracture perforating. VI block of Xinli oilfield remaining oil distribution is studied in detail through the research method which combines dynamic production data analysis, static factors analysis and reservoir three-dimensional modeling technology. Studies have shown that the remaining oil potential of Xinli oilfield VI block is great.

Key words: *remaining oil dynamic factors static factors Xinli oilfield*

I. INTRODUCTION

Predecessors have a detailed study of the formation mechanism of geological characteristics classification of the extra-low permeability reservoirs[1-5], aim at the low permeability characteristics of Xinli oilfield VI block, and mostly they start with from static research of reservoir, but a lot of dynamic information appeared in the mid-late reservoir development, it is not yet formed a complete set of work process that how to combine the dynamic and static data in order to develop extra-low permeable reservoir research. Here, VI block in Xinli oilfield as an example, geological analysis technique, three-dimensional modeling, dynamic production data analysis technology and other modern reservoir description techniques and methods are used under the comprehensive analyzed of reservoir geological characteristics of logging curves and oilfield dynamic production data, the static factors and dynamic factors that affect the remaining oil distribution is analyzed by using geology and reservoir sedimentology and logging digital processing and integrated interpretation, etc as theoretical guidance through the computer technology, and the study area comprehensive development adjustment suggestion is put forward.

II. GEOLOGICAL SURVEY

Xinli oil production is located in the territory of Qianguo county, Jilin Province, Songyuan, including Xinli oilfield, Xinbei oilfield which is in the northern part and south valley oilfield. Located on the tectonic zone in southern Songliao Basin, central depression help uplift of the western end of the new, wood nose structure east, north, west, south plunging in Cologne, Changling depression.Study area (as shown in regional structure figure 1), which is Xinli oilfield Ⅵblock, is located in the western of this oil field, development area is 8.49 km^2, Geological reserves are 5.8241 million tons, recoverable reserves are 1.68995 million tons, calibration recovery efficiency is 29%. The purpose of the development of the Lower Cretaceous layer Quantou Izumi upper three segments of Fuyu, Yangdachengzi reservoir, This reservoir is mainly composed of fine sandstone, and belongs to the river-delta sedimentary system. Constructed, Xinli Oilfield VI block north of VI1, VI2 unit Quantou top surface structure of the northwest-dipping monoclinic structure with northeast trending fault-based, less fault,

southern VI3 unit Quantou top surface structure for the West half anticline dipping fault more north-south trending fault structure is further complicated.This block reservoir belongs to low permeability-lithologic reservoir. Control factors of the reservoir have obvious difference in various directions; it is mainly controlled by the faults and tectonics in the east-west direction, while by lithology in the north-south direction. The block has entered high water cut development stage, and stabilizing oil water control is difficult. The understanding of the remaining oil distribution is not enough, feasible direction of potential measures is lack of. Water injection effect of Local well pattern development is not obvious, and there is a larger influence on water injection with strong reservoir heterogeneity.

III. RESEARCH ON MAIN CONTROL FACTORS OF REMAINING OIL

2.1 control of sedimentary micro relative residual oil

Study area has 7 class sedimentary microfacies, include (underwater) distributary channel, abandoned channel, natural levee, crevasse splay, overbank sand, flood plain, sand sheet. Xinli Oilfield Block VI Fuyang reservoir depth of 1100 ~ 1500m ,The reservoir thickness is 5.0 ~ 30.0 m, reservoir lithology is mainly siltstone and fine sandstone, reservoir porosity is mainly between 5% ~ 19%, permeability is mainly between $0.01\times10\text{-}3\mu m^2$～$11.05\times10\text{-}3\mu m^2$, it belongs to medium - low porosity and low permeability reservoir.

J+28-015.1 、J10-17 、X207 wells sedimentary facies first 8,10,13,18 small layer,There are medium-sized river through, The average thickness of 8 small layer of sand is 4.8m; an average thickness of 10 small layer of sand is 6.1m; the average thickness of 13 small layer of sand is 5.9m; the average thickness of 8 small layer of sand is 6.8m, he area of channel position with better reservoir physical property is beneficial to oil and gas gathering, and has good oil and gas shows.

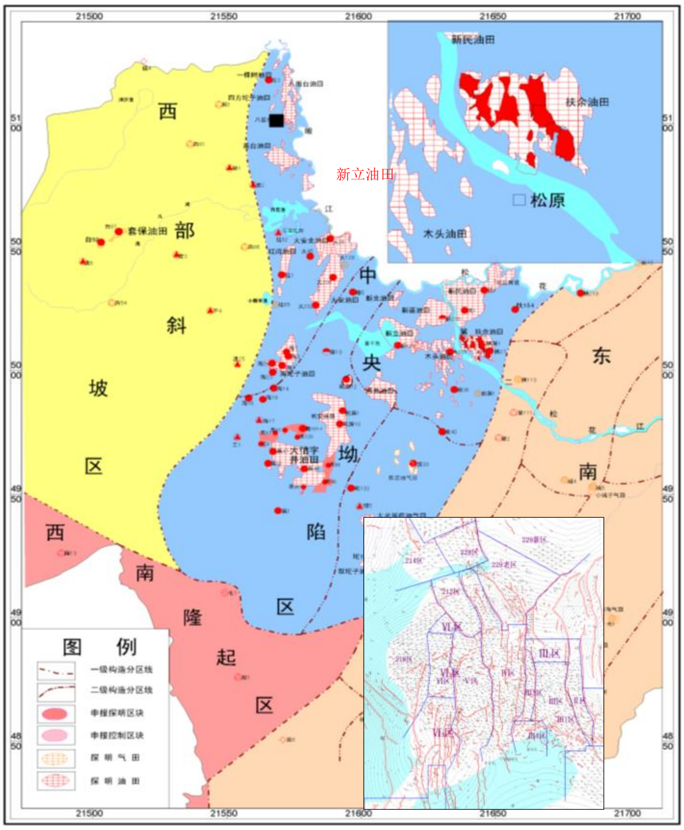

Fig.1. Xinli oilfield area and tectonic locations

2.2 The effect of construction on the remaining oil

Research shows that the oil-bearing of the channel sand near the faults at the higher position of structure is the best. And the downdropped block fault can be effectively keep out of oil and gas. Ji20-15 at the lower position of structure produces fluid, not oil. J+16-13.1 and J+8-17 at the lower position. The total output of J+16-13.1 from December 2005 to 2012 is only 13t. From September the liquid yield of J+8-17 is 3t and the oil yield is only 0.12t every month. The moisture content was generally 96%. Until December 2012 there is no liquid producing. Seeing Table 1.

Table 1 The table of the well production data analysis

signs	launched date	perforated intervals	the liquid yield / (m^3▪d^{-1})	the oil yield / (m^3▪d^{-1})	the water yield / (m^3▪d^{-1})	moisture content （%）
J20-15	2000.05	Fuyu reservoir	9.8	0	9.8	100
J+16-13.1	2005.12	Fuyu reservoir	6.5	0	6.5	100
J+8-17	2012.08	Fuyu reservoir	10.2	2.8	7.4	72.5

2.3 Study remaining oil use the dynamic production dates

Using the water injection allocation、perforated intervals、the dates of the oil or water yield to analysis the situation of well fluid producing, water drive effect and sure the relative enriched area of remaining oil. This is one of the methods of analyzing the remaining oil distribution qualitatively. VI block set up new fields in the study area has 29 injection-production patterns. Here are two that exemplify in Table 2.the statistic of injection-production pattern

Table 2 The statistic of injection-production pattern

water injection well	Benefit from water injection Wells
J20-13	J+20-13，J20-013
J+18-021	J18-19，J18-21

(1) J20-13 has a major impact on J+20-13、Ji20-013, Mainly reflected in Produced fluid volume increases, the moisture content increased, oil production decline(see in Table 3). The results show that the connectivity injection-production layer of J+20-13 and J20-013 is good, the rate of water breakthrough is fast. The oil of the reservoir pore drives to the water or water flooded zone. There the remaining oil is less. But the affection of J20+13 to J20-013 is small, and J20-013 is at the higher position of structure, and the remaining oil is more.

Table 3 The liquid yield of Ji20-13

signs	the monthly liquid yield /t	the monthly oil yield	the monthly water yield	newly moisture content	originally moisture content
J18-19	59.7	13.6	46.1	89.5	79.8
J18-21	116.8	48.9	57.9	13.8	45.5

(2) The water injection well J+18-021 works for J18-19 and J18-21. There are not perforation at J18-19 and J18-21, so the liquid yield, the water yield, and the volatile of moisture content is not obvious after injection. We could see that the saturation water content of Ji18-21 is relatively lower, oil production situation is better, and it is near the faults at the higher position of nose structure from Table 4. So there should be the distribution of remaining oil.

Table 4 The liquid yield of J+18-021

signs	the monthly liquid yield /t	the monthly oil yield /t	the monthly water yield /t	newly moisture content /%	originally moisture content /%
J18-19	48.8	35.5	13.3	27.3	26.8
J18-21	40.5	13.3	27.2	67.1	58.1

IV. THE REMAINING OIL PREDICTION FAVORABLE AREAS

Utilizing comprehensive geological analysis method and dynamic comprehensive analysis method, combining previous research results [6-9], to study the remaining oil distribution characteristics and the status of the distribution at new oilfield VI block, evaluate the exploitation potentiality. And then put forward the corresponding comprehensive development adjustment suggestion. Based on the comprehensive analysis of data and modeling data from VI block [10-14], there are 4 well with no perforation (see Table 5), and recommend perforation. J22-19, Located in the big river, is cut off by the abandoned channel. J20-11.1、J22-11 and J+22-17 Located in the side of medium-sized river. Besides the fault block, reservoir physical property and oiliness are better, and enrichment of remaining oil is better, so recommend perforation.

Table 5 The statistic of No perforation sand body at 7, 8 small layers

signs	small layers	top depth/m	low depth/m	thickness /m	porosity /%	permeability /μm²	oil saturation /%	interpretation
J22-19	8	1216.2	1218	1.8	4.48	13.79	49.56	oil-water layers
J20-11.1	7	1150.4	1152	1.6	4.66	13.58	46.87	poor reservoir
J22-11	7	1146.2	1148.4	2.2	4.27	14.56	53.19	poor reservoir
J+22-17	7	1138.4	1140.6	2.2	5.48	18.9	59.86	Oil layer

V. CONCLUSION

(1) Through analyzes the static and dynamic influence factors of remaining oil distribution in the study area, the static influence factors of remaining oil distribution are that there are rich remaining oil in small faults and high tectonic at structural aspects and distributaries channel with abundant remaining oil, abandoned channel with larger bending and distributary mud blocks the remaining oil distribution in the sedimentary fancies.

(2) Injection-production pattern、perforating horizon and the way of Water drive oil are the main dynamic factors which affecting the residual oil distribution.

(3) Obtained the reasonable and effective methods of researching remaining oil is that combining the dynamic and static production data which affect the remaining oil distribution and three-dimensional geological model. At the three-dimensional geological modeling the geological model of reservoir prediction expressed visually the distribution law of remaining oil in the ground three dimensional spaces. And could get the underground arbitrary profile and arbitrary point on the changes of reservoir structure, etc. Comprehensive anglicizing the laws affecting ride the formation and distribution of residual oil with dynamic and static factors could provide the powerful basis for the oilfield development adjustment.

REFERENCES

[1] Zhang Guoqing, Zhang Xiaoqiu. Residual oil control factor analysis of Xinminxileimin 23 blocks. Science technology and engineering. 2011,11(30).

[2] Fan Guangjuan, Ma Shizhong. A detailed study on sedimentary microfacies in single sand body level in Daqing oilfield apricot twelve area. Geological review, Science technology and engineering. 2011,11(7):31-35.

[3] Wang Jiping. Xinmin oil field research of sedimentary microfiches and flow units[D]. Daqing petroleum institute, Heilongjiang province,2005.

[4] Feng Zhikun, Zhang Xingjin, Ma Shizhong.ect. Geology analysis of low permeable sandstone oil field development[M]. science and technology press in Harbin, Heilongjiang,1994.

[5] Han Jie, Wang Jingyao, Li Jun. Reservoir structure characterization and control factors of single sand bodies of Fuyu oil[J]. Geoscience, 2011,25(2);308-314.

[6] Zeng Renqian, Li Shuzhen. The Chinese type and geological characteristics of low permeability sandstone reservoir. Acta Petrolei Sinica, 1994;15(1):38-46.

[7] Liu Dianzhong. Study of remaining oil distribution at the analysis of the dynamic monitoring data. Inner Mongolia Petrochemical Technology, 2002;29:119-121.

[8] Liu Jianmin, Xu Shouyu. Fluvial facies reservoir sedimentation model and the control of the remaining oil distribution. Acta petrolei Sinica, Acta Petrolei Sinica,2003.

[9] Han Dakuang.ect. Fundamentals of Numerical Reservoir Simulation [M]. Beijing, Petroleum industry press 1993.

[10] Tong Xianzhang. Oil well production and reservoir dynamic analysis. [M]. Beijing: petroleum industry press, 1981.

[11] Liu Baoma, Xie Jun. Residual oil technology research status and progress in our country [J]. Northwestern Geology, 1997,81.

[12] Briggs, B.J.etal 一 Locating the Remaining Oil in Producing Fields, OIL GAS-EuropeanMagazine. 1991,2.

[13] Chang, Y.C,K.K. Mohanty,Scale-up of two-phase flow in heterogeneous porousMedia,Journal of Petroleum Science and Engineering 18(1997):21-34.

[14] Guangrning,Ti etal. Use of flow unit as a tool for reservoir description: acasestudt. SPE